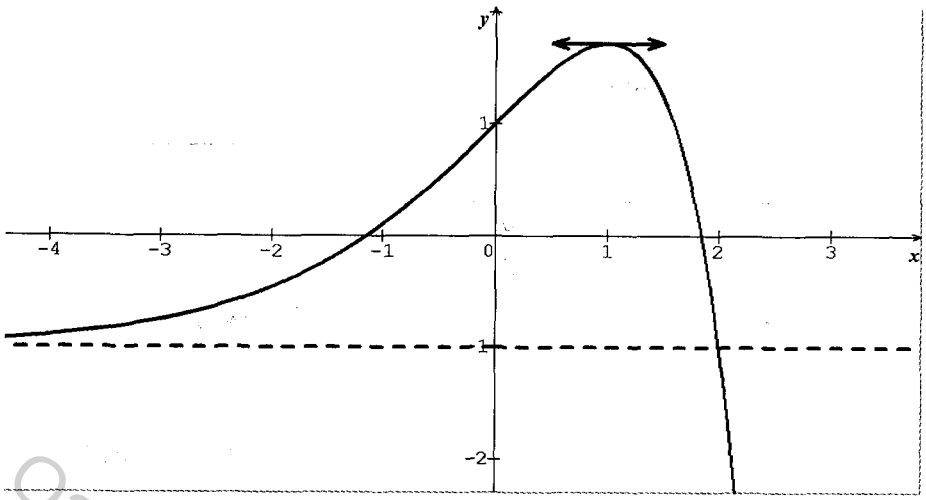
d)



Exercice 4

$$I_{(p,n)} = \int_0^1 x^p (1-x)^n dx$$

1) $$I_{(p,0)} = \int_0^1 x^p dx = \frac{1}{p+1}$$

$$I_{(p,1)} = \int_0^1 x^p (1-x) dx = \int_0^1 x^p dx - \int_0^1 x^{p+1} dx$$

$$I_{(p,1)} = \frac{1}{p+1} - \frac{1}{p+2} = \frac{1}{(p+1)(p+2)}$$

2) $$I_{(0,n)} = \int_0^1 (1-x)^n dx = \left[-\frac{1}{n+1}(1-x)^{n+1} \right]_0^1 \Rightarrow$$

$$I_{(0,n)} = \frac{1}{n+1}$$

$$I_{(1,n)} = \int_0^1 x(1-x)^n dx = \left[-\frac{x}{n+1}(1-x)^{n+1} \right]_0^1 + \frac{1}{n+1} \int_0^1 (1-x)^{n+1} dx$$

$$I_{(1,n)} = \frac{1}{n+1} + \frac{1}{n+2}$$

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